

Borehole

50-06-18**Log Event A****Borehole Information**

Farm : <u>T</u>	Tank : <u>T-106</u>	Site Number : <u>299-W10-196</u>
N-Coord : <u>43,517</u>	W-Coord : <u>75,802</u>	TOC Elevation : <u>673.51</u>
Water Level, ft : <u>Dry</u>	Date Drilled : <u>4/13/1993</u>	

Casing Record

Type : <u>Steel-welded</u>	Thickness, in. : <u>0.365</u>	ID, in. : <u>10</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>73</u>	
Type : <u>Steel-welded</u>	Thickness, in. : <u>0.322</u>	ID, in. : <u>8</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>114</u>	
Type : <u>Steel-welded</u>	Thickness, in. : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>176</u>	

Cement Bottom, ft. : <u>10</u>	Cement Top, ft. : <u>0</u>
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Borehole Notes:

Borehole 50-06-18 was completed in April 1993 to a total depth of 180 ft. Data from the drilling log and Freeman-Pollard et al. (1994) were used to provide borehole construction information. The borehole was drilled using schedule-40, carbon-steel casing. Temporary 12-in. surface casing was installed to a depth of 10 ft. The borehole was then telescoped to total depth using 10-in., 8-in., and 6-in. casings. The 10-in. and 8-in. casings were installed to depths of 73 and 113 ft, respectively. The 6-in. casing was advanced to 180 ft. Bentonite seals were placed at the bottom of the 10-in., 8-in., and 6-in. casing strings to prevent migration of contaminants along the casings. The annulus between the 10-in. borehole casing and the 12-in. surface casing was filled with grout from 10 ft to the ground surface as the surface casing was removed. None of the casing strings were perforated. The thicknesses of the 6-in., 8-in., and 10-in. casings are presumed to be 0.280 in., 0.322 in., and 0.365 in., respectively, on the basis of the published thickness for schedule-40, 6-in., 8-in., and 10-in. steel tubing.

Equipment Information

Logging System : <u>2B</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>11/1997</u>	Calibration Reference : <u>GJO-HAN-20</u>	Logging Procedure : <u>MAC-VZCP 1.7.10-1</u>

Logging Information

Log Run Number : <u>1</u>	Log Run Date : <u>07/20/1998</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>0.0</u>	Counting Time, sec.: <u>200</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>8.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

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Log Run Number :	<u>2</u>	Log Run Date :	<u>07/21/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>7.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>34.5</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>3</u>	Log Run Date :	<u>07/21/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>33.5</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>R</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>52.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>4</u>	Log Run Date :	<u>07/21/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>51.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>55.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>5</u>	Log Run Date :	<u>07/21/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>54.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>R</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>58.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>6</u>	Log Run Date :	<u>07/22/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>57.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>R</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>68.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>7</u>	Log Run Date :	<u>07/22/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>67.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>116.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>8</u>	Log Run Date :	<u>07/23/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>175.5</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>115.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Logging Operation Notes:

This borehole was logged by the SGLS in eight log runs using a 200-s counting time. A concrete surface pad surrounds the borehole casing. The top of the surface pad rises 0.3 ft above the ground surface, and the borehole casing sticks up 1.6 ft above the top of the surface pad. The top of surface pad was used as the zero reference point for the SGLS. The total logging depth achieved was 175.5 ft.

Increasing dead time was encountered during log runs two and four at depths of 34.5 and 55 ft, respectively. As a result, log runs three, five, and six were logged in real time from 33.5 to 52 ft, 54 to 58 ft, and 57 to 68 ft, respectively.



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Analysis Information

Analyst : E. Larsen

Data Processing Reference : MAC-VZCP 1.7.9

Analysis Date : 08/04/1998

Analysis Notes :

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the accepted calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

This borehole is triple cased with 6-in., 8-in., and 10-in.-diameter casings to a depth of 73 ft, double cased with 6-in.- and 8-in.-diameter casings from 73 to 114 ft, and single cased with 6-in.-diameter casing from 114 ft to total depth. A casing correction factor for a 0.98-in.-thick steel casing was applied to the concentration data collected from the ground surface to 73 ft because it most closely matched the 0.967-in. total combined thickness of the triple casing. A casing correction factor for a 0.65-in.-thick steel casing was applied to the concentration data collected from 73 to 113 ft because it most closely matched the 0.602-in. total combined thickness of the double casing.

Shape factor analysis was not performed on the data collected from the ground surface to 113 ft because this portion of the borehole is either double or triple cased. Spectra recorded in these casing configurations yield shape factors that cannot be interpreted. However, shape factors were calculated for the measured gamma-ray spectra collected from the single-cased portion of the borehole (113 to 176 ft).

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the estimated uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A plot of the shape factor analysis results from 100 to 210 ft is included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

A plot is included that compares the individual Radionuclide Logging System (RLS) log-run data collected during borehole drilling activities between November 1992 and February 1993. A plot is also included that compares the 1993 log-run data with data collected using the RLS in 1994. Separate plots are presented that compare the 1994 RLS data with the spectral gamma data collected with the SGLS in 1998. Uncertainty bars and MDLs are not included on any of these plots.

An additional plot is also included that provides a detailed comparison of the Co-60 contamination detected by

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the RLS in 1994 and the SGLS in 1998 between 70 and 90 ft. The SGLS log plot includes error bars showing the statistical uncertainties in the calculated Co-60 concentrations at the 95-percent confidence level.

Results/Interpretations:

The radionuclide concentrations identified in this section are reported as only apparent concentrations and are underestimated.

Detector saturation occurred from 35.5 to 44 ft. As a result, no usable spectral data were collected along this region of the borehole.

The man-made radionuclides Cs-137, Co-60, Eu-154, Eu-152, and Sn-126 were detected by the SGLS. The Cs-137 contamination was measured continuously from the ground surface to 35 ft and from 44.5 to 73 ft. The Co-60 contamination was measured continuously from 45 to 122 ft. Occurrences of Co-60 were also detected at 34.5, 123.5, and 124.5 ft. The Eu-154 contamination was detected from 33.5 to 34.5 ft and continuously from 44.5 to 88 ft. The Eu-152 contamination was detected at 8.5 ft and nearly continuously from 46 to 72.5 ft. The Sn-126 contamination was detected at 49 and 49.5 ft.

All of the K-40 and Th-232 concentration values are absent from 35 to 50.5 ft and 55 to 60 ft. Many of the U-238 concentrations are absent between the ground surface and 34 ft. All of the U-238 concentrations are absent from 34.5 to 73 ft.

Relatively decreased K-40 concentration values were detected between the ground surface and 15 ft. A zone of decreased K-40 concentrations was detected from 73 to 76.5 ft. Increased Th-232 concentrations were detected from about 82 to 91 ft. Sharply decreased K-40 and Th-232 concentration values occur from 91 to 97 ft and 100 to 105 ft. Sharp peaks in the U-238 concentrations were detected at 94 and 102.5 ft. A zone of very low K-40 concentrations was detected at about 124 ft and correspond with slight increases in the U-238 and Th-232 concentrations at this depth. Generally low KUT concentrations were detected below about 125 ft.

Additional information and interpretations of log data, including a comparison of the SGLS data with the earlier spectral gamma data, are presented in the main body of the Tank Summary Data Report for tank T-106.